

## SUPPORTING INFORMATION

### CHARACTERIZATIONS OF THE PRISTINE PVDF AND PVDF -g- PS

Differential Scanning Calorimetry measurements were carried out in TA DSC 2010 equipment containing thermal analysis software for data interpretation to investigate the changes in the thermal properties; the enthalpy of fusion and crystallization. In representative runs, 3-4 mg of samples in sealed standard pans were ramped from 15 °C temperature to 350 °C at heating rate of 2 °C/ min. To avoid oxidative degradation, the sample and reference pans were purged with nitrogen at a constant flow rate of 68 ml min<sup>-1</sup>.

The heat of fusion ( $\Delta H_f$ ) was obtained from the area under the melting thermo gram. The crystallinity ( $X_c$ ) in sample was obtained in Equation 1:

$$\%Crystallinity = \frac{\Delta H_f}{\Delta H_f (Crys)} \times 100 \quad (1)$$

$\Delta H_f$  is the heat of fusion of the sample and  $\Delta H_{f(crys)}$  is the heat of fusion of 100 % crystalline PVDF and was taken as 104.7 Jg<sup>-1</sup>. For - PS - g - PVDF, the percentage crystallinity was calculated by correcting the recorded  $\Delta H_f$  dividing by the weight fraction of PVDF in the investigated sample.

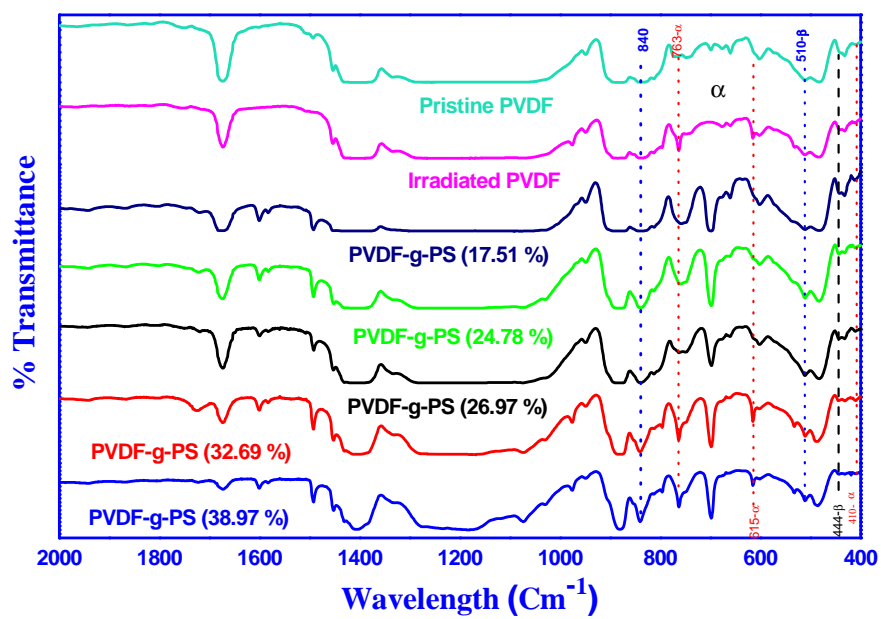
Thermogravimetric studies were carried out on a TA instrument mode 2950 in a temperature range of room temperature to 900 °C with a heating rate of 10 °C/ min. The samples were dried under vacuum at 60 °C for 24 h and then were stored under desiccator. TGA runs were carried out on samples having typical weight of 10 - 20 mg.

To verify changes in the structure of PVDF before and after graft copolymerization, the infrared spectra of the pristine and grafted PVDF polymer powders were obtained. The Perkin-Elmer system 2000 FTIR was used to characterize the polymeric films. The FTIR spectra were obtained with 8 scans per sample over the range of 4000 – 400  $\text{cm}^{-1}$  with 4  $\text{cm}^{-1}$  resolution.

The water contact angle of the PVDF and the grafted films were determined using an optical contact angle meter system (Dataphysics, OCA-20) at ambient temperature to study the hydrophobicity of the films. The grafted PVDF films were stored for approximately one week after being prepared at room temperature in air prior to their contact angle analysis. The films were then placed on glass slides and fastened on both ends using Teflon tapes. At least five independent determinations at different sites of one sample were taken.

The crystal structure of the PVDF and the grafted films (different % of grafting) was determined by Bruker D8 discover GADDS X-ray diffractometer (XRD) (40 kV, 40 mA).

The topography of the pristine PVDF film and grafted film (with optimized grafting) was studied on an atomic force microscope (Asylum Research MFP-3D) using Pt/Ir coated tip.



**Figure S1.** FTIR spectra of pristine PVDF, irradiated PVDF, and PVDF- g- PS polymer with different percentage of grafting

**Table S1.** Optimization of various reaction parameters for maximum percentage graft copolymerization of styrene onto PVDF polymer powder

Sr. No.	Radiation Dose (Mrad)	Temperature (°C)	Solvent ml	Time (Hrs)	Monomer mol/L×10 <sup>-2</sup>	% Grafting
1.	0.2	40	10	4	218.47	1.72
2.	0.4	40	10	4	218.47	4.55
3.	0.6	40	10	4	218.47	6.93
4.	0.8	40	10	4	218.47	8.51
5.	1.0	40	10	4	218.47	11.38
6.	1.2	40	10	4	218.47	13.87
7.	1.4	40	10	4	218.47	15.79
8.	1.6	40	10	4	218.47	17.51
9.	1.8	40	10	4	218.47	16.29
10.	2.0	40	10	4	218.47	14.57
11.	1.6	45	10	4	218.47	18.98
12.	1.6	50	10	4	218.47	20.58
13.	1.6	55	10	4	218.47	22.15
14.	1.6	60	10	4	218.47	24.78
15.	1.6	65	10	4	218.47	23.17
16.	1.6	70	10	4	218.47	21.58
17.	1.6	60	5	4	218.47	17.41
18.	1.6	60	15	4	218.47	26.97

19.	1.6	60	20	4	218.47	24.71
20.	1.6	60	25	4	218.47	22.38
21.	1.6	60	15	1	218.47	11.27
22.	1.6	60	15	2	218.47	17.38
23.	1.6	60	15	3	218.47	21.97
24.	1.6	60	15	5	218.47	29.75
25.	1.6	60	15	6	218.47	32.69
26.	1.6	60	15	7	218.47	27.05
27.	1.6	60	15	6	262.16	33.36
28.	1.6	60	15	6	305.86	34.79
29.	1.6	60	15	6	332.20	36.25
30.	1.6	60	15	6	375.77	38.97
31.	1.6	60	15	6	393.25	37.03
32.	1.6	60	15	6	410.73	34.19